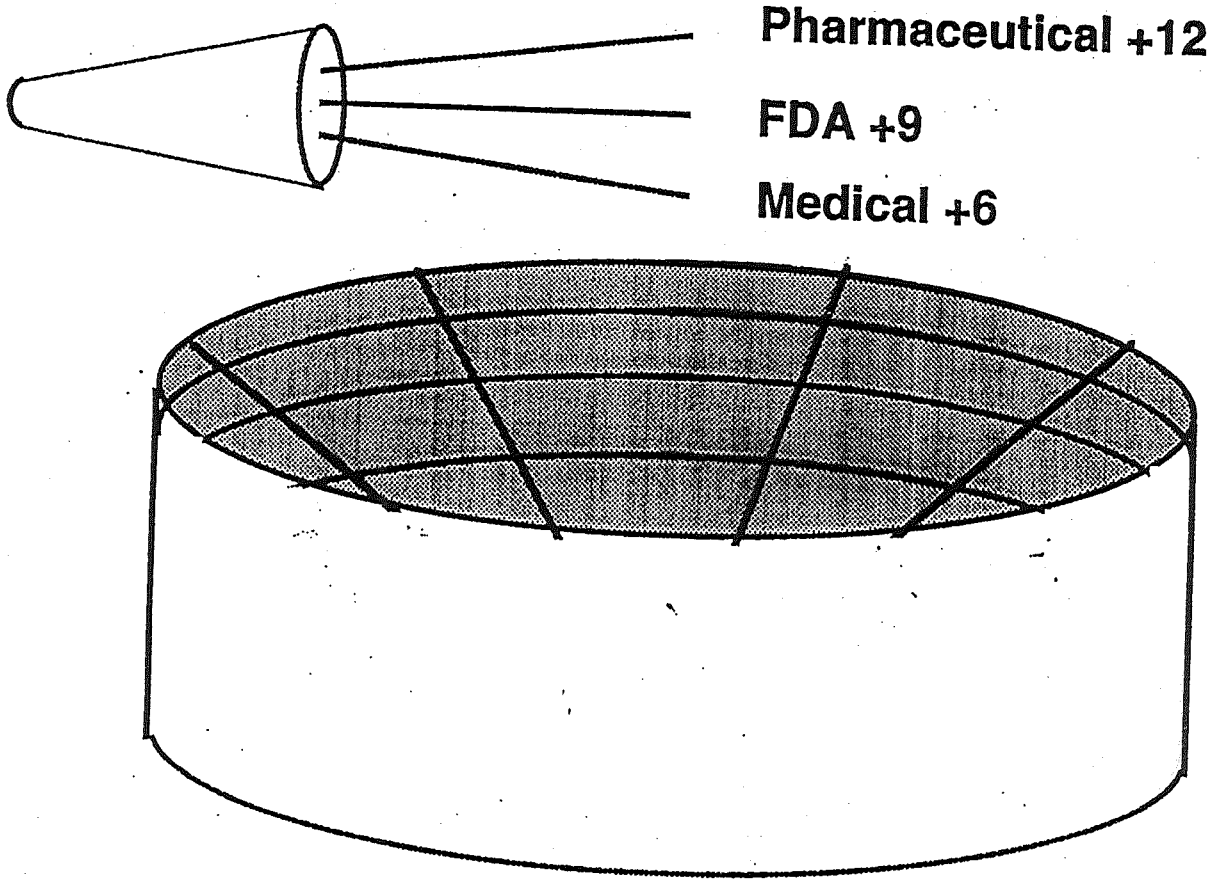
Data Parallelism:
Searching all the documents at once



The New IBM Electronic Data Processing Machines

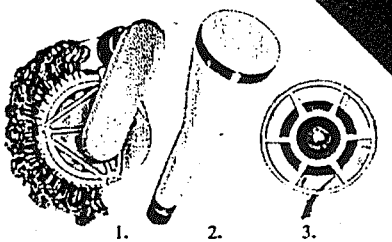
For Science Industry... Defense

Combining the great storage capacities and speeds of cathode ray tubes, magnetic drums, and magnetic tapes with the tremendous computing speeds of electronic tubes, IBM engineers and scientists have produced in these machines the most flexible and most productive calculating unit ever marketed.

Here is a computer that can add and subtract 16,666 times a second . . . that can multiply and divide 2,192 times a second . . . and can recall factors from storage, or "memory," in as little as 12 millionths of a second.

This momentous advance in electronic computing gives defense industries, for which this computer was especially designed, a tool of vast power and versatility. For peacetime uses, it will be applied to a wide variety of engineering, research, and scientific problems.

The new IBM Electronic Data Processing Machines are the forerunners of data processing machines for business, now under intensive development in IBM laboratories.



1. 2. 3.

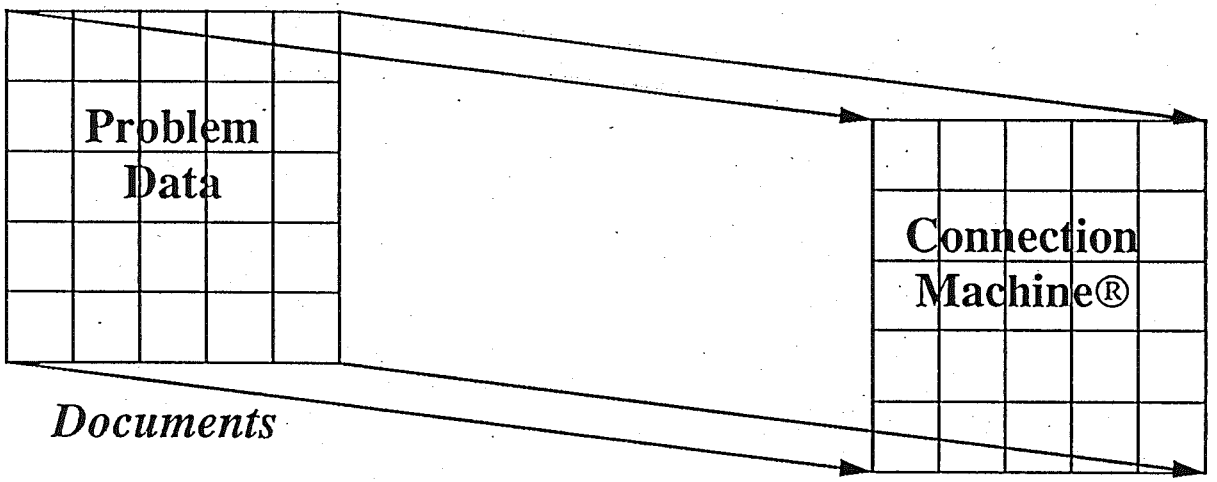
3 KINDS OF "MEMORY"

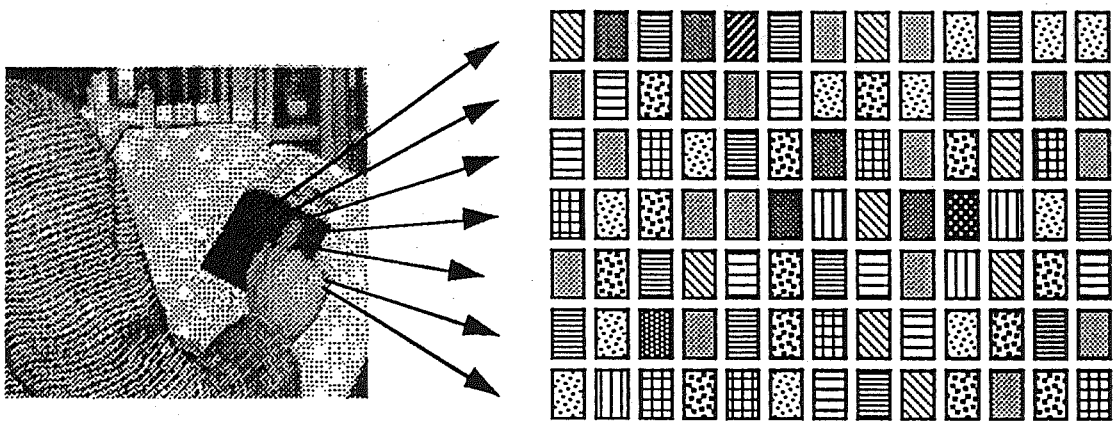
(1) Magnetic drums—any of 81,920 digits* can be stored or recalled in an average of 40/1,000 of a second. (2) Cathode ray tubes—any of 10,240 digits* can be stored or recalled in 12/1,000,000 of a second. (3) Magnetic tapes—any of 2,000,000 digits* can be stored on *one* tape or recalled from it at the rate of 12,500 a second.

**Expressed in terms of equivalent decimal digits.*

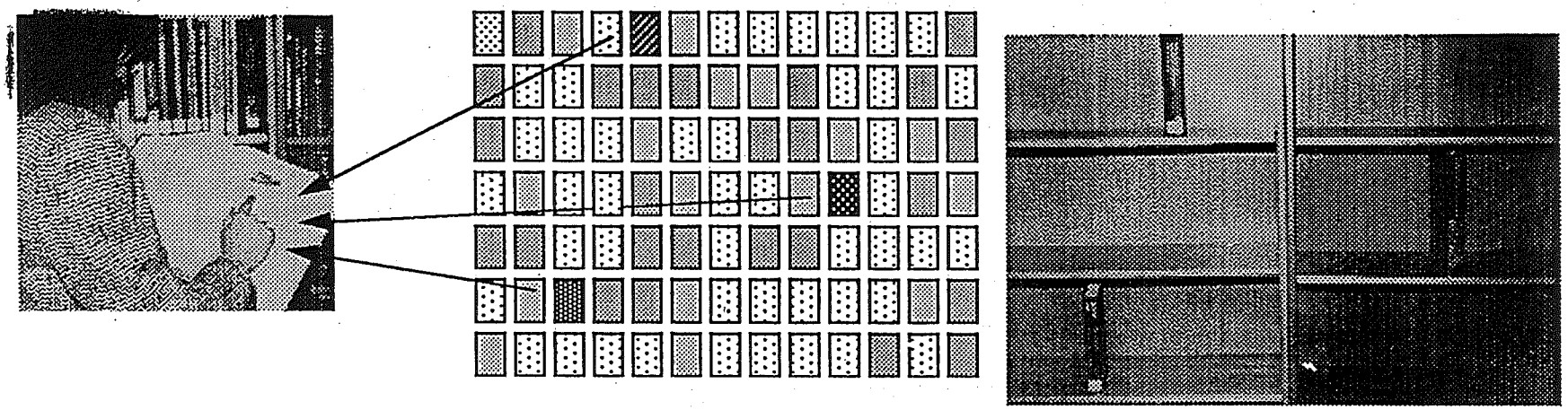
IBM INTERNATIONAL BUSINESS MACHINES
590 Madison Avenue, New York 22, N. Y.

Information Retrieval





An example document is compared to all the others, in parallel.

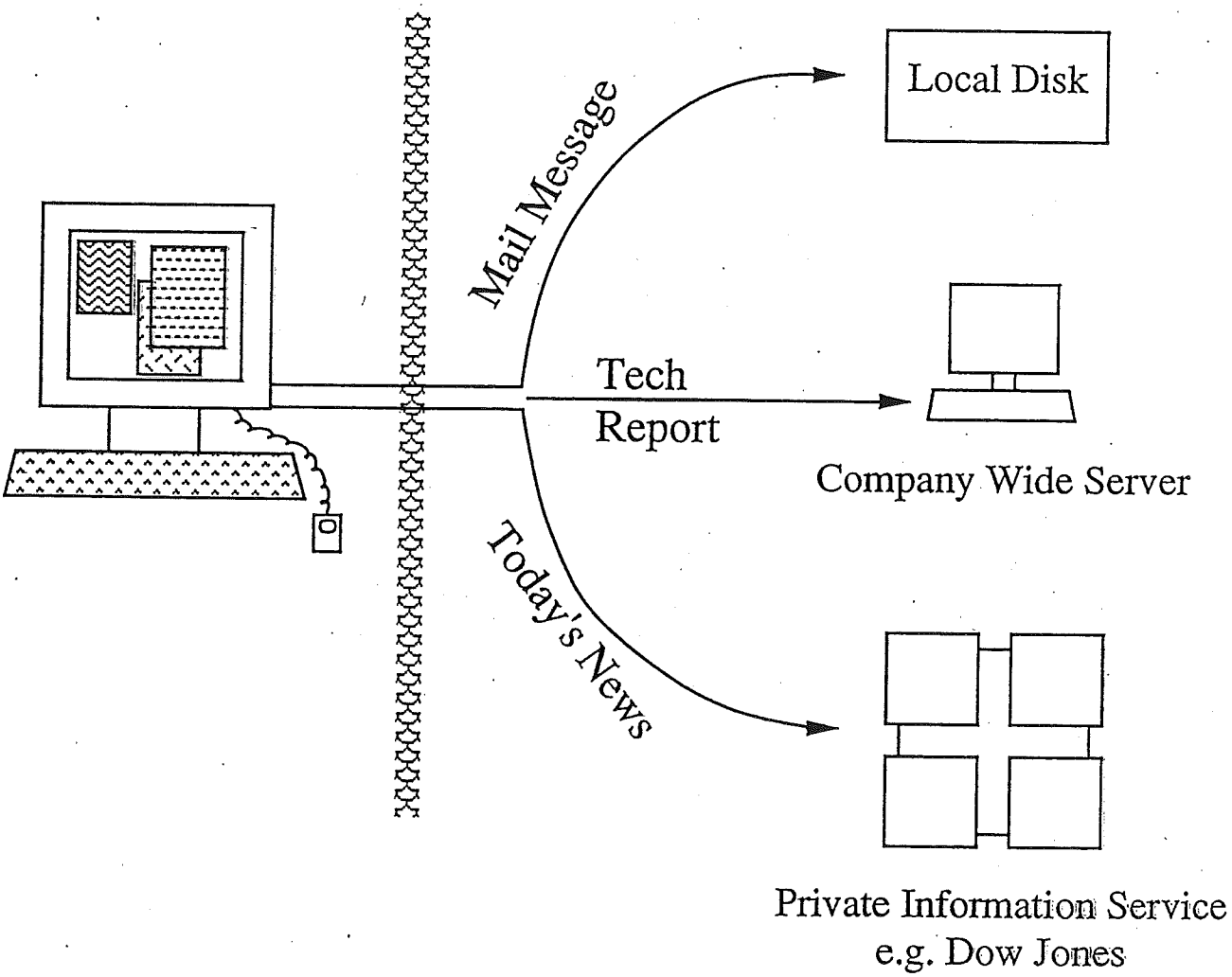


Only the best matches are presented to the user.

- In an agrarian society the inability to grow things is inconceivable.
- In an industrial society the inability to make things is inconceivable.
- In an information society the inability to understand things is inconceivable.

Wide Area Information Server (WAIS)

User interface on Macintoshes which allows users to seamlessly interact with many different databases



Standard Protocol: NISO Z39.50 - 1988

What Thinking Machines Is Doing

- Operating an on-line supercomputer system.
- Systematically loading it with current company data.
- Making it available at every desk in the company.

Information Utilities + Dynabooks

- Cable TV + HDTV + cellular data/phone + (Prodigy®) + information services + PC/WS's + warehouse-sized data-supercomputers

- **Endangered**:

- movie theatres
- TV networks; radio
- video recorders
- video stores
- magazines/newspapers
- libraries, books (print)
- stores and malls
- paper office?
- US mail, including junk!
- mail order/catalogs
- video game machines

- **Growth**:

- electronic marketplace
- interactive ads
- smarter phones (#/phone)
- "talking toasters"
- auto & appliance self-repair via modules
- dynamic presentations
- telepresence/teleconferences
- virtual reality

Grand Challenges

Human Genome

- Relatively easy
  O(100,000) chromosomes x
  O(2000) amino acids each x
  O(10) auxilliary information & multiple examples
  = O(2 TBytes)

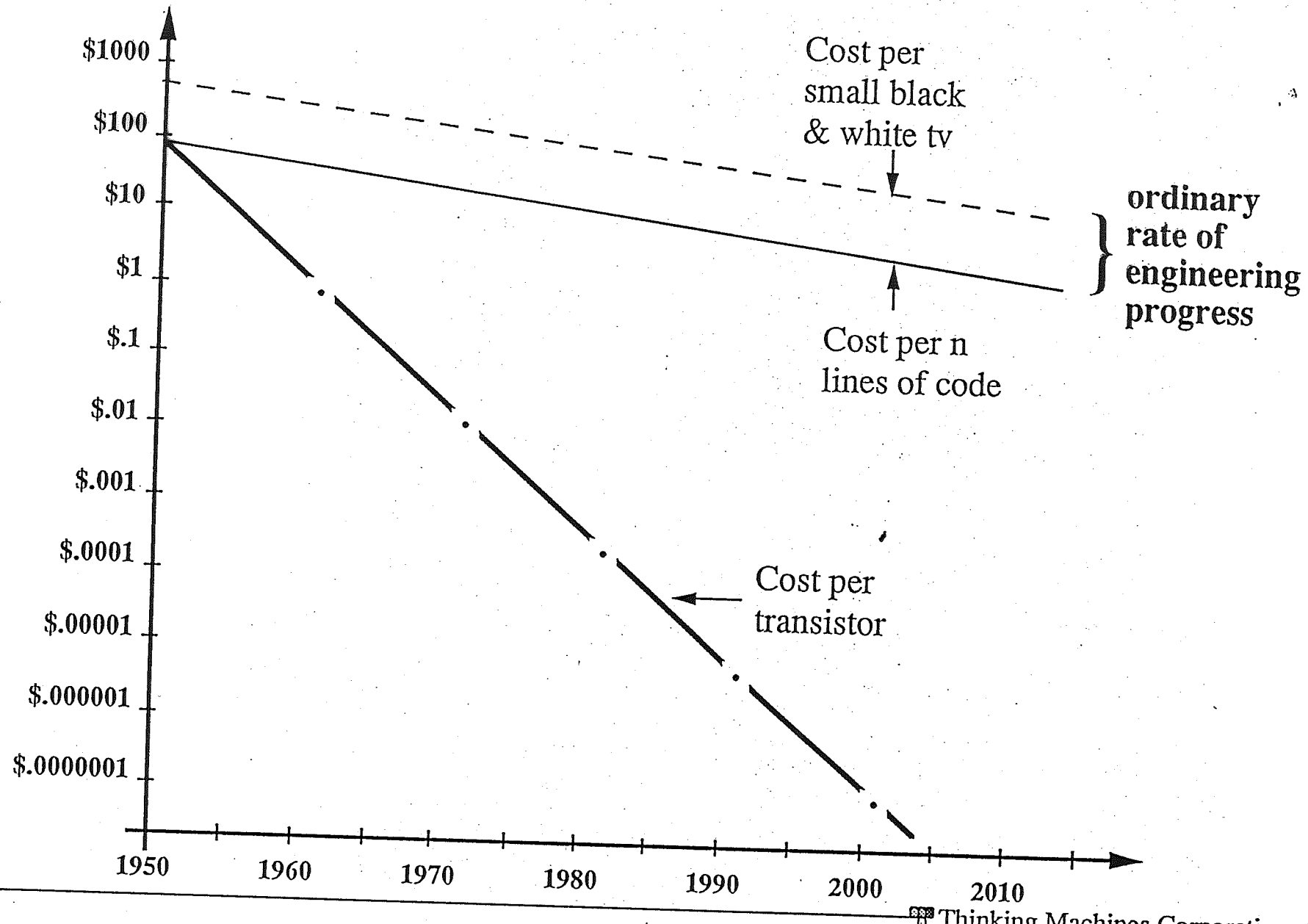
Library of Congress

- 40 TBytes (?) not counting visual material
- @ 10 sec./page, 6 years (3 shifts) with 1000 scanners
  (assuming no human correction needed) (See Smith, TMC, 1988)
- @ 1/10 cost every 5 years, CM system for 40 TB would cost
  ~$100M in 1995, ~10M in 2000

Images

- ~5 PetaBytes (= 5 x 10^{15} Bytes) of satellite data by 1995!

Hardware costs have changed at an abnormal rate!



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